

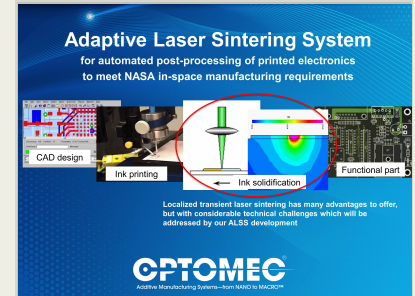
# Adaptive Laser Sintering System for In-Space Printed Electronics, Phase I

Completed Technology Project (2017 - 2017)



## Project Introduction

The goal of this project is to enhance the Optomec Aerosol Jet(R) technology for additive manufacturing by introduction of an Adaptive Laser Sintering System (ALSS) module to enable a fully automated system for printed electronics. The Optomec-Harding team seeks to reduce the localized laser sintering concept to practice by developing ALSS with in-situ automated adjustment of laser power and processing time. ALSS will include a laser for sintering with sensors to monitor the process so that any flaws in the printed electronics circuitry can be repaired with minimal human intervention. The benefit will be two-fold: it will enable Optomec, Inc. to expand its commercial applications of the Aerosol Jet technology in printed electronics industry, and to pave the way for the use of this advanced technology in the next generation of human space exploration. The success of this endeavor will be of vital importance to the NASA's in-space, on-demand manufacturing capabilities to support the unique challenges of long-duration human spaceflight. The developed automated adaptive in-line quality control system with ALSS is also applicable to that required for long-duration human space missions with minimal need for astronaut intervention, when printing conformal electronics and sensors onto flexible substrates of various geometrical complexities using the Aerosol Jet technology. The liquid metal nanoparticle (NP) inks as printed are not conductive enough for required circuit functionality; they must be transformed to solid metal path by a sintering at an elevated temperature. To reduce sintering time and exposure of the substrate to damaging temperatures, localized laser sintering has been shown to be promising. The challenge to commercialization of laser sintering is controlling the laser power and processing time required for effective sintering of metal NP inks while avoiding thermal damage to substrate, which will be addressed by the ALSS.



Adaptive Laser Sintering System for In-space Printed Electronics, Phase I Briefing Chart Image

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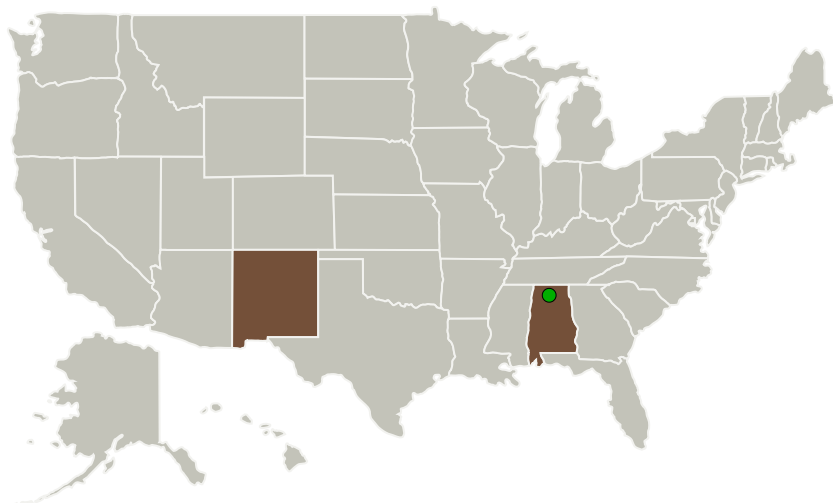
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Optomec Design Co	Lead Organization	Industry	Albuquerque, New Mexico
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Primary U.S. Work Locations

Alabama	New Mexico
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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Optomec Design Co

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

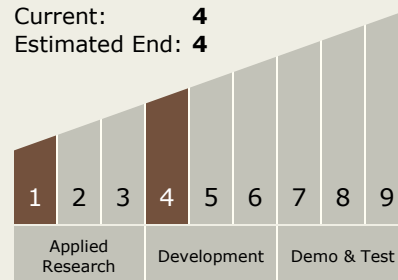
Carlos Torrez

**Principal Investigator:**

Michael J Renn

## Technology Maturity (TRL)

Start: **1**  
 Current: **4**  
 Estimated End: **4**

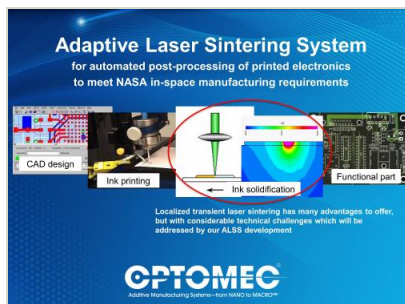


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## Images



### Briefing Chart Image

Adaptive Laser Sintering System for  
In-space Printed Electronics, Phase  
I Briefing Chart Image  
(<https://techport.nasa.gov/image/131977>)

## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.4 Manufacturing
    - └ TX12.4.2 Intelligent Integrated Manufacturing

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System